1470.2

92 cents per ton on trips of ten days or less which would be equivalent to sixteen trips per season, 88 cents per ton for a trip of eleven days but only 85 cents per ton for trips taking more than eleven days.

During this period, between 1842-45, under the supervision of James Archbald, extensive improvements were made upon the gravity railroad inorder to keep pace with the increased capacity of the canal. On the west side of the Moosic Mountains the location of the entire road, with the exception of Plane No. 1 was changed and a better grade, favoring the loaded cars, was obtained. On the east side of the mountain, Plane No. 6, which was originally the longest on the road, was divided into two separate planes; also an entirely new and separate track was built from the foot of Plane No. 7 to Honesdale, a distance of 10 miles. This was the greatest single improvement, for the original section, between Planes No. 7 and 8, had been single tracked with two-turnouts or sidings. Here the loaded cars now not only had a continuous down grade of 10 miles, but it was no longer necessary to lower the loaded cars at Plane No. 8. There were no changes of importance made in the light track east of the summit, but one important improvement was the replacement, throughout the length of the road, of the old wood and strap iron rails by the new "T" iron rails manufactured at Slocum Hollow (Scranton).

In spite of these substantial improvements on the canal and the gravity railroad the demand for anthracite was growing so rapidly that it could not be met. The improvements on the canal had cost the company slightly more than $250,000, but the savings in the cost of transporting the company's own coal had evceeded that figure by 50%, even including the period when the full capacity of the canal was not yet available, but by 1847 the "Flickers" had largely disappeared from the canal, the 40-tonners had themselves been "hipped" and the newest boats were now able to carry as much as 55 tons without danger of grounding. In short, the year 1848 was, inspite of the usual delays from freshets and washouts, a good one, for over seven thousand cargoes of coal were carried to tidewater between April 25, when the canal opened, and December 4th, when it was closed by freezing.

With these facts at hand, the board of managers on November 17th, 1847, approved the recommendations of chief engineer R. F. Lord for the enlargement of the entire canal to a minimum depth of six feet. They included the enlargement of the rocks which were to be further improved by the addition of more paddle gates to speed up the passage of boats. The berm bank of the canal along the Lackawaxen and Delaware Rivers was to be made more secure against the wash from the boats by the erection of stonework where necessary, for there had been many delays resulting from boats grounding on sandbars caused by the embrankment washing down into the canal. The work of enlargement was begun upon the cessation of boating early in December 1847, and about the same time Chief Engineer Lord made a trip to Pittsburgh to examine the aqueduct built by John A. Roebling who many years later was to win everlasting fame as the engineer of the great Brooklyn Bridge. Lord's report was most favorable for the Pittsburg aqueduct kas a substantial work and Roebling's engineering ability was far ahead of the times. Roebling was engaged to begin work for the D. & H. at once.

Construction of these aqueducts when the company was able to finance them, had been contemplated since 1841. In fact John Wurts stated, at the Kingston hearing in 1858, that they had been under consideration from the very early days of the canal but in any event their construction was hastened by the approach of the Erie Railroad into the Welaware Valley as the D. & H. wished to prevent the prior location of the Erie tracks from affecting the most advantageous location of the new canal route.

Roebling completed the masonry on the Delaware aqueduct in January, 1848, at which time the cut stone for the Lackawaxen aqueduct was on hand and Engineer Lord wrote to Mr. Wurts stating that both spans would be ready for use in the fall of 1848. However they were not brought into use until April 26th, when the canal opened for the season.

Poling the boats across the Delaware, on the pond created by the dam just below the mouth of the Lackawaxen, had always been slow, dangerous and subject to frequent delays because of high water in the spring and fall. The mules seem to have been the only one to profit by the old route for they were afforded a well-earned rest as they were carried across the old rope ferry.

The new aqueducts necessitated the construction of three new locks (Number 70, 71 and 72) on the Delaware to bring the boats to the new high level but at the same time locks Numbers 1, 2 and 3 on the Lackawaxen were eliminated. The Lackawaxen aqueduct crossed that river three hundred yards above its mouth. the Delaware span about the same distance below. There being no physical obstruction to prevent it, why did not the company build a single aqueduct across the Delaware River above the mouth of the Lackawaxen, rather than bridging both rivers?

These aqueducts are monuments to the engineering skill and courage of their builder.

The Delaware span, now (1945) a highway bridge, is probably the oldest suspension span still in use. Roebling built to endure and never did he compromise for economy sake. He demanded the best material available, the most exacting wohkmanship and personally supervised every detail.

In January, 1849, Roebling wrote to Henry V. Poor, in New York, giving the following specifications:

" Delaware aqueduct, four spans, 132 to 142 feet each.

Truck width at bottom 17 feet 6 inches.

Truck width at top 20 fet.

Depth of water 6 feet.

Weight of water in 142 foot span 482.

Tension of cables 708 tons.

Diameter of cables 8½ inches.

Each cable contains 2150 wires.

Cable wt per lineal foot 130 lbs.

Ultimate strength of cables 3870 tons.

Lackawaxen aqueduct two spans 114 feet each.

Each Cable seven inches in diameter.

(Same as Pittsburg aqueduct).

The wires do not extend below the ground but connect with ancor chains, the cross section of which exceeds that of the wire by 50%.

Strength of wire being 90,000 lbs. per superficial inch while chains will not bear over 60,000 lbs."

Later that year, Roebling is quoted in the Honesdale Democrat as stating that there were 7688-cubic yards of hydraulic cement masonry in the Deleware aqueduct.

More modern bridges have been swept away but Roebling's have withstood every flood and ice for almost a century.

While the construction of these aqueducts was in progress, construction was begun on suspension aqueducts to replace the original wood and stone aqueduct across the Neversink River near Cuddebackville and the stone arch aqueduct across Rondout Creek at High Falls. Except that these aqueducts were single spans they were similar in construction to the Delaware and Lackawaxen aqueducts. Both were ready for operation when the 1851 season opened. Speaking of the Delaware and Lackawaxen aqueducts. Chief Engineer Lord estimated that they had avoided delays due to high water totaling nine days during their first year of use and furthermore, with the elimination of the